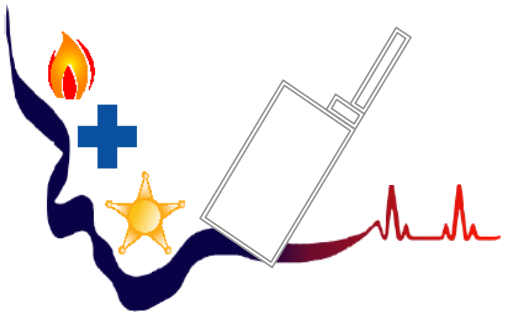

NTIP Estimated Staffing, Cost Estimates and Implementation Schedule Deliverable-H

NORTHERN TIER INTEROPERABILITY PROJECT

September 14, 2004

Federal Engineering, Inc.
10600 Arrowhead Dr, Suite 160
Fairfax, VA 22030
703 359-8200

1 Executive Summary

Federal Engineering (***FE***) has recently provided the Northern Tier Interoperability Project (NTIP) consortium with a Baseline System Design document. With the acceptance of this design, ***FE*** has prepared additional documentation based on that design. The information contained in this document describes the maintenance staffing, implementation schedule, cost estimates, and risk analysis for the system as described in the Baseline System Design document.

FE has included in this document, the methodology applied, the assumptions used, and the final recommendations made based on that information. These preliminary recommendations, while believed to be accurate, will continue to be refined throughout the remainder of this project to ensure that the NTIP system is implemented with the minimum risk.

1.1 Staffing Recommendations

FE has developed three alternatives for providing maintenance staffing for the system. These options are presented with the expectation of providing the best combination of quality of service and cost effectiveness. To properly support a mission critical communications system, all maintenance options assume providing a four-hour response time, 24 hours per day, 7 days a week, 365 days per year.

- Option #1 suggests that the NTIP consortium and/or the State hire the full staff of employees required to maintain the NTIP system. The system maintenance personnel would include a communications system manager, five technicians, and possibly an administrative assistant. In addition, staff would be required to operate a help desk to receive trouble calls and dispatch the technicians. The help desk resources would most likely be shared with other State departments and not require new staff.

- Option #2 prescribes using available commercial service depots located across the region for the maintenance and repair of the system. NTIP and/or the State would furnish the communications system manager to oversee the system and system support help desk to provide central system maintenance call taking and dispatching. As discussed in Option #1, an existing State organization would likely provide the help desk function.

- Option #3 supports the concept of using the selected equipment vendor to provide all of the system support and maintenance functions. This includes maintenance and repair of all system equipment and providing system maintenance call taking and dispatching, 24 hours, 7 days a week. The communications system manager would be responsible for monitoring their activities and would be the primary contact within the State for issues regarding the system.

Each of these three fundamental options can be implemented in several different forms, with the NTIP Consortium and/or the State taking more or less responsibility for the system maintenance and service tasks, or sharing various portions of the required staff with other operations.

FE has recommended the second option as the most suitable given the specifics of the NTIP system and region. This option is also the most flexible to adapt to the needs of the NTIP system in the long-term.

1.2 Prioritized System Requirements and Implementation

The many user requirements which the NTIP system will need to fulfill have been prioritized to assist in the development of the implementation plan. The core system requirements of interoperability, reliability, coverage and capacity combined with input received from the NTIP member agencies has driven the prioritization of the major sub-systems.

The ***FE*** methodology for determining the best approach to prioritizing system implementation is based on both user requirements and system implementation schedule requirements. The optimal schedule attempts to balance these two criteria. ***FE***'s recommendation for prioritizing the various sub-systems is as follows:

1. Wide Area Trunked Voice System
2. Completion of Interconnect Network
3. Local Area Trunked Voice Systems
4. Local Area Conventional Voice Systems
5. P25 Data Systems As Required
6. Dedicated Data System
7. UHF Paging System

The recommended implementation schedule uses this prioritization adjusted to allow for parallel activities where appropriate to most efficiently implement the system. ***FE'***s recommendation is to initially install the wide area portion of the NTIP system. This is intended to most quickly meet the fundamental requirement for interoperable communications while providing secondary communications to all local agencies. This installation includes the deployment of a significant portion of the interconnection network.

This wide area system deployment will be followed by the implementation of the local area systems. The installations will start with the trunked sub-systems, and the conventional systems will follow. During this phase, the remainder of the interconnection network will be installed.

The data systems will be implemented later based upon the lack of immediate need derived from user inputs. The implementation plan for data systems will take into account the ultimate decisions regarding the technology and coverage area for data operation. The deployment of the UHF paging system has been prioritized last due to the issues surrounding the coordination of the radio frequency for that system.

This prioritization may be impacted by the realities of system deployment in the region. Weather and other schedule factors may affect the order of the sub-system deployment throughout the scheduled implementation time.

1.3 System Implementation Timeline

The system implementation timeline shows the tasks required for the procurement, construction and testing of the NTIP system. This implementation schedule is based on information contained within the NTIP Baseline System Design document and the system prioritization discussed earlier. Although this system implementation timeline is preliminary, the information used has been derived from similar system implementations. This helps assure that the proposed NTIP implementation schedule is accurate and applicable.

The NTIP Implementation Schedule below (Chart 1-1) graphically shows how the various tasks are structured.

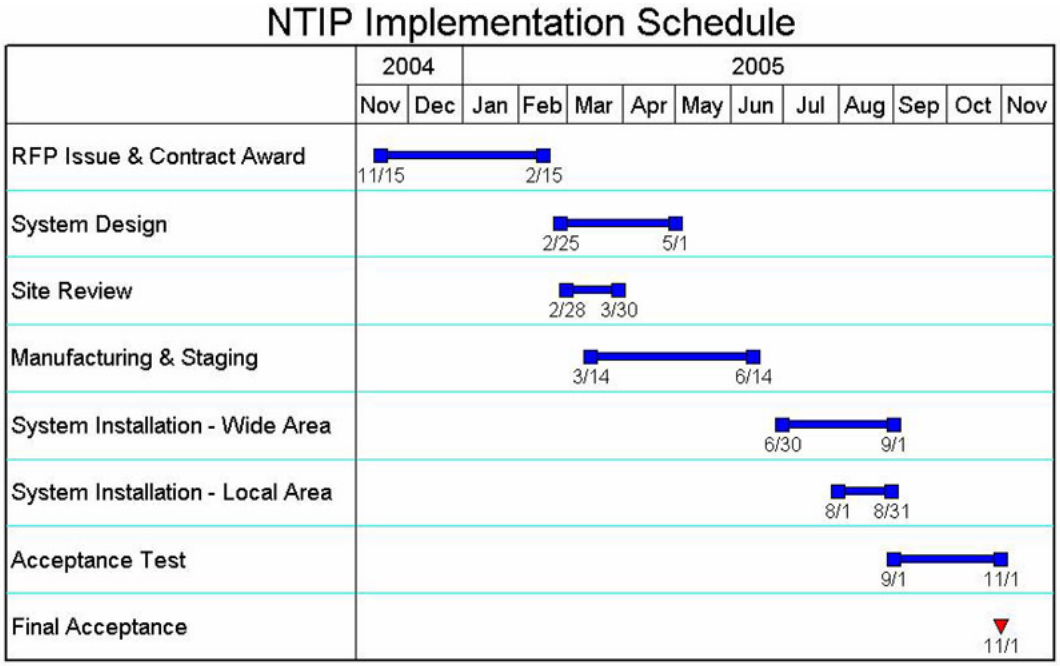

Chart 1-1

The time line shown is based on the RFP being released in mid November 2004, and acceptance in November 2005. A later start date will result in an equally delayed finish date. Both the onset if the winter season, and the restrictions on some of the funding sources will complicate the implementation if there is a significant delay in the start of the procurement.

1.4 System Cost Estimates Overview

FE has developed preliminary cost estimates for the NTIP system. These cost estimates are based on the Baseline System Design document and will be refined as the design is finalized. The system cost estimates are based on pricing that has been proposed for other similar scale systems. ***FE*** has used cost information from public sources to arrive at typical, non-vendor specific list price. These prices have been applied to the equipment list for the Baseline System Design to develop the hardware cost estimate.

FE has applied a factor to estimate the cost of services required to implement the system. Total services have been found historically to range from 25% to 50% of equipment cost. Services have been estimated at 40% of the equipment cost for radio and microwave systems, and 8% of cost for constructions tasks, such as towers and buildings.

The estimated total cost for the system is $14,850,000. ***FE*** anticipates that a competitive procurement process should yield a significant cost reduction. This estimate is intended for use in project budgeting and prioritization. ***FE*** recommends careful attention to the stated assumptions in the use of this cost estimate.

1.5 Risk Analysis Overview

The needs analysis, design and the associated implementation plans are based on the information provided to ***FE*** by the NTIP member agencies. The needs analysis and the design have been presented to, and agreed upon by the NTIP member agencies. This however does not eliminate all the risks associated with the project. As with any project this large and complex, there are always areas where risks exist.

These risks are categorized two ways, financial risks and schedule risks. Financial risks relate to either the availability of funding or the costs associated with the system deployment. Schedule risks involve any of the many factors that could alter the deployment schedule.

As the design, schedule and costs are refined; the risk factors that remain will require specific attention. Each risk factor will be addressed with a contingency or mitigation plan. With the exception of the risk associated with the unsecured nature of the funding, ***FE*** does not anticipate any other risks to become significant.

The cost estimate does includes a 10% contingency factor to address some level of financial risk, however, it should be noted that the estimated schedule does not contain contingency time.

2 Staffing Recommendations

The Northern Tier Interoperability Project system will span an area of over 550 miles across the Montana-Canadian border. This vast region creates unique challenges for the maintenance and support of the system. These challenges will require an equally unique approach to providing effective on-site fixed equipment repair throughout the Northern Tier region.

This region presents additional challenges, with its extremely sparse population and severe winter weather. These factors compound the issues created by the expanse of the region. Some of these issues can be mitigated through system design choices. As an example, providing equipment redundancy at sites located within sparsely populated areas and in areas that may be difficult to access during the winter months may reduce the need for critical service. While design choices, such as that mentioned, increase system costs, they reduce the critical effects of a component failure and therefore may reduce service costs.

2.1 Public Safety - Mission Critical Support

Public Safety communications systems are considered "mission critical" for the operations they support. Therefore, these systems have extremely rigorous requirements for system maintenance and the restoration of service after a failure. The typical service program must provide a four-hour response time from the report of a failure and support 24 hour a day, 7 days a week response to system outages and other maintenance issues.

In order to provide this level of service for the NTIP system, service facilities will need to be located throughout the region. Additionally, the staff of these service facilities will require the appropriate technical training, spare parts and test equipment for the full range of equipment and sub-systems which make up the NTIP system.

FE understands the challenges present in the region, both physical and financial. To meet these challenges in a cost effective manner, the NTIP maintenance and service plan may have to adjust some aspects of the service plan while minimizing or mitigating any associated risk through other approaches.

One area where the service plan may need to be adjusted is with regard to providing a four-hour response time to all system or site failures. Due to the considerable expanse of the region, specific types of failures will need to be prioritized and the time window for service may have to be extended. The risk of an extended outage that this creates will need to be addressed either through system redundancies and/or overlapping coverage. These potential solutions can carry a significant cost. These costs will need to be evaluated against the risk.

2.2 System Support Methodologies

FE has first applied a "Top-Down" methodology to the issue of proper staffing for the support of the NTIP system. This provides a view of the optimum sized staff required without constraining costs. This base staffing approach must then be rationalized to achieve a reasonable and cost effective staffing plan.

The "Top Down" staffing methodology applied in option #1 represents the costs should the NTIP Consortium and/or the State choose to provide maintenance service and support for the entire NTIP system across all the member counties. The suggested staffing presented is higher than typically required due to the geographic expanse of the system. This is to insure the system can be maintained to the required level of system availability and radio coverage to which it is designed.

Large scale and statewide systems similar to NTIP often face considerable difficulty in justifying the full staffing required for their support. The large area being covered relative the quantity of equipment involved creates a situation where the minimum number of technicians required to properly handle the repair of a system failure is significantly more than needed for normal maintenance. These technicians end up being under utilized much of the time.

In addition to the technical service operation, the NTIP Consortium and/or the State would need to provide a help desk for the reporting of service and maintenance issues. This help desk would also be responsible for monitoring and tracking the user/customer satisfaction with the entire service process.

The second service staffing methodology considered is the use of the existing service and repair organizations of the commercial equipment vendors and other competent repair facilities located within the region. For this option to be implemented successfully in a system of this scope it is recommended that the direct user/customer contact responsibilities remain within the control of the NTIP Consortium and/or the State. For this reason this option includes the requirement that the NTIP Consortium and/or the State provide the help desk to receive trouble reports and service requests and the staff to coordinate the required maintenance services.

The third staffing option considered by ***FE*** is having the entire maintenance and support functions outsourced to a commercial entity. This type of maintenance and service operation is typically coordinated by the principal vendor of the system. For this option to be successfully implemented it will require the selected vendor to take full service responsibility for all the equipment and sub-systems within the NTIP system. In addition, the selected vendor will be required to staff and operate the trouble-reporting call center in a manner that ensures that the quality of service and the satisfaction of the customers/users can be monitored and controlled.

Within each of these fundamental maintenance options, there are many aspects that can be varied to optimize the effectiveness of the service staff. Examples of this include the sharing of help desk or service operations among different systems, or the combination of state maintenance staff supporting mobile radio sub-systems and vendor supported maintenance of the microwave system. These sharing opportunities will be investigated as part of the detailed service planning activities during the vendor's detailed system design.

2.3 Support Options

The charter and goal of the NTIP system is to improve communications between local, state, federal, and tribal law enforcement authorities by providing interoperable digital voice and data radio capabilities along Montana's northern border region. The system can only meet these goals in the long term if it is properly managed and maintained.

The following staffing scenarios have been developed to provide the NTIP Consortium with a range of options from which it can select the most appropriate solution to their requirements. Each of these solutions provides different trade-offs between the cost, quality and control of the maintenance and service operations. There is no "one" best solution. ***FE*** has developed a set of cost effective solutions that can render sufficient quality of service for the system at a reasonable cost. The tables below show the staff required for each option presented for the NTIP system maintenance and support structure.

2.3.1 Option #1

The first option investigated is the "Top-Down" approach. In this scenario the NTIP Consortium and/or the State would need to create and staff an organization to fully support the NTIP system. This organization would provide maintenance service and technical support for the communications operations to all of the member agencies. Repairs of radio communications equipment and maintenance of the radio system backbone would be conducted by a dedicated maintenance unit. This maintenance unit would also perform mobile and portable, radio unit repairs.

The personnel staffing requirements for Option #1 shown in Table 2-1 below.

Position	Staffing
Communications System Manager	1
Sr. Telecommunications Technicians	2
Telecommunications Technicians	3

Table 2-1

Table 2-1 shows a total staff of six, including one management position and five technicians. The help desk staff is not included as it is expected that these responsibilities could be handled within an existing operation. The system manger will hold overall responsibility for the maintenance staff, system database management, system monitoring, radio controls and system report generation. The technicians could perform help desk duties during work hours. Additional call taker staff would be required for evening and weekend coverage if a suitable department to fill this function is not found.

While an in-house approach of this type would seem to be most effective due to the direct control, there are several operational drawbacks beyond having the highest staffing requirements of the three options.

The limited technical staff would have to be housed in more than one location lowering their effectiveness with regard to work sharing and back-up coverage. Multiple sets of system spare parts and test equipment would have to be purchased, and several vehicles would have to be purchased and maintained.

This option does open the widest range of possibilities for variants. Most of these variations have to do with sharing the staff and hardware resources with other organizations that need, or have in place, similar management and maintenance operations. The required responsibilities could be assumed in whole or in part by an existing organization. If a suitable existing organization can not be found a new organization could assume responsibility for the management and maintenance of other systems that are currently outsourced, or under-maintained. Examples of departments within the state that are likely candidates are the Montana Department of Transportation or the State Information Technology Department.

One of the easiest functions to share is the help desk operation. An existing state department with 24 hour call taking and dispatch operations may be able to handle system trouble without significant additional staffing.

2.3.2 Option #2

The second option presented provides a typically more cost effective operational and maintenance approach. Under this approach the NTIP Consortium and/or the State would contract local commercial entities to provide the maintenance and service required by the system. These local providers would furnish the on-site equipment repair service across the region. Like in Option #1, the NTIP Consortium and/or the State would establish a system support help desk to provide the users centralized call taking and dispatch services. System maintenance would also be coordinated by this operation. This provides for the capture of detailed trouble call and service information, allowing the review of response times and corrective actions required. This information is critical from the long-term support of the system.

The system support help desk would contact the appropriate local service provider to take action on the service or maintenance issue. Each service provider would supply the support engineers and technical resources to troubleshoot and repair the system infrastructure. This allows the use of multiple service providers with expertise in particular equipment and/or sub-systems.

This approach may be implemented in several ways. The primary choice to be made is between directly contracting with each local service company verses contracting with a single company to obtain the local services. Many of these companies are the same ones already providing technical services to some members of the NTIP consortium today.

NTIP personnel staffing requirements for option #2 are as follows:

Position	Staffing
Communications System	1
Call Taker and Dispatch Function Shared with other operations (Not new staff)	5

Table 2-2

As with the first option presented, the help desk function can easily be shared with other operations, or be implemented from within an existing department. In addition, some system services could be provided by an existing technical service department within the State, such as the Montana Department of Transportation, service operation. These decisions should be carefully evaluated, as they can significantly impact the cost and effectiveness of the operation.

2.3.3 Option #3

The third option presented is to have a single vendor handle all service under contract. This would include providing all system maintenance as well as providing the call taking and dispatching functions required for 24 hour, 7 days response. This type of service is typically offered by the major systems vendors, either directly, or through a partner. Many of the companies which would provide these services are already providing technical services to many of the NTIP member agencies.

The use of this type of service and maintenance plan minimizes the staff required by the NTIP Consortium and/or the State. However, it does not remove all required tasks. Even with all service outsourced, ***FE*** recommends that a Communications System Manager position be maintained. The Communications System Manager would oversee system database management, system monitoring and system report generation, and function as the principle contact for all issues regarding the operation of the NTIP system. This option could provide a suitable solution with minimal additional staff required from NTIP.

NTIP personnel staffing requirements for option #3 are as follows:

Position	Staffing
Communications System Manager	1

Table 2-3

The position of Communications System Manager may be able to handle other responsibilities within the organization, but it should be cautioned that the management of the system is their primary responsibility. With proper coordination, this position could also be used for the management of additional systems similar to the NTIP system. This could provide a very cost effective solution to systems maintenance throughout the State of Montana. Depending on the structure of this position, there may be need for an administrative assistant position.

2.4 System Management and Maintenance Staffing Recommendations

Due to the many possible solutions available that meet the needs of the NTIP system for management and maintenance, it is difficult to select one optimum plan. ***FE*** preliminary recommendation is to pursue the plan described in Section 2.3 Option #2. This plan can easily be adapted as the program moves forward. These adaptations have the effect of the NTIP Consortium and/or the State taking more or less responsibility for the day-to-day management and maintenance activities. They will also affect the staffing required and the overall cost of the system support.

In concert with this planning effort, the NTIP Consortium should pursue partnerships with other organization within the State where existing maintenance, service and help desk operations can be best leveraged to meet the needs of the NTIP system.

FE recommends that during the procurement process, each vendor be given the opportunity to present their management and maintenance options. This will provide the NTIP consortium with the most accurate cost information on which to base their final decision.

3 Prioritized System Requirements

The requirements documented earlier in this program by ***FE*** and presented and agreed to by the NTIP members have been prioritized to assist in the further refinement of the design. This prioritization is based on the fundamental goals of the NTIP system and the input received from member agencies. The core system requirements that ***FE*** has considered are interoperability, reliability, coverage and capacity. These requirements along with member agency inputs were used in the prioritization of the implementation plan.

The following list enumerates the priority given to each of the sub-systems of the NTIP system.

1. Wide Area Trunked Voice System
   Includes interconnect network requirements
   Includes site improvements
2. Remainder of Interconnect Network
   Includes site improvements
3. Local Area Trunked Voice Systems
   Includes site improvements
4. Local Area Conventional Voice Systems
   Includes site improvements
5. P25 Data Systems As Required
   Includes site improvements
6. Dedicated UHF Data System
   Includes site improvements
7. UHF Paging System

Although ***FE***'s recommended prioritization of these sub-systems is shown in a linear manner, there will be significant overlap in the actual implementation as discussed later in this document.

FE's recommended prioritization is based on the requirement that the NTIP system provide interoperable communications across the region. During the refinement of the implementation plan in the next deliverable document, these priorities may be adjusted. These adjustments will be based on the needs of the members of the NTIP consortium and the ability of their existing systems to meet those needs. In addition, the timing, quantity and any limitations on the available funding sources will be taken into account.

The data systems have been prioritized lower due to the specific input on the wide spread importance of interoperable voice communications, and the relatively lower interest in wide spread data services. The UHF paging system is shown as the lowest priority principally due to the extended length of time it is expected to coordinate the radio frequency due to Canadian border issues.

The implementation may also be impacted by the realities of system deployment in the region. Weather and other schedule factors may affect the prioritization of the sub-systems throughout the scheduled implementation time.

4 Prioritized System Implementation

FE's recommended system implementation plan is based on the prioritized requirements as discussed in Section 3 above. The prioritization of the implementation tasks ensure that the core system requirements are given appropriate consideration.

The proposed prioritized system implementation plan will determine the sequence of installation of the radio sites and system wide features for the region. This system prioritization is intended to best meet NTIP's immediate and long-term requirements.

4.1 Overview

The ***FE*** methodology for determining the best approach to prioritizing system implementation is based on both, user system requirements, and system implementation schedule requirements. The optimal approach must attempt to balance both these criteria.

FE's recommendation is to initially install the wide area portion of the NTIP system. This is intended to most quickly meet the fundamental requirement for interoperable communications while providing secondary communications to all local agencies. This installation will include the deployment of a significant portion of the interconnection network. The specific interconnection links to be implemented at this time will be determined by the selected vendor during their detailed design work.

The wide area system implementation will be followed by the implementation of the local area systems. The installations will start with the trunked sub-systems, and the conventional systems will follow. During this phase, the remainder of the interconnection network will be deployed.

The data systems will be implemented last based upon the lack of immediate need derived from user input. The implementation plan for data systems will take into account the ultimate decisions regarding the required coverage area for either P-25 VHF or dedicated UHF data operation.

4.2 Implementation Timing

In developing the implementation schedule ***FE*** has attempted to balance the core requirements of system interoperability, reliability and coverage, against the realities of the Montana environment and the restrictions on the funding sources. As shown in the NTIP Implementation Schedule in Section 5.3 (Chart 5-1) the majority of installation work will be completed before November 2005. This schedule will allow the completion of a significant amount of the system build out before the onset of the winter months, and also aligns well with the deadlines for certain grant expenses.

The large amount of travel required to install the wide area portion of the system is an important factor in prioritizing system implementation. Although this schedule has attempted to avoid site installation during the winter months, weather conditions will likely affect the final implementation timeline. The schedule developed does not contain contingency time for unforeseen events, such as severe weather.

4.3 Recommended Prioritized Implementation Plan

FE's recommendation is to design and install the wide area portion of the system initially. This will provide primary interoperable communications across the region and secondary communications for all the local agencies. This portion of the system will incorporate the 10 to 12 interconnected trunked radio sites of the NTIP system and provide seamless roaming throughout the region.

The implementation of the Wide Area system will require the build out of significant portions of the interconnection network. The specific links to be included in this portion of the deployment will be identified by the selected vendor during their detailed design effort.

Following the deployment of the wide area system, the local area coverage portions of the system will be implemented. This will provide enhanced local coverage and capacity to counties, municipalities and Indian tribal reservations. At that time, agencies will be provided with dispatch equipment that will provide control of local channels and access to the wide area system for interoperability.

The deployment of the local area systems will begin with the trunked sub-systems, and proceed through the region. The scheduling will take into account several factors, including:

- The existing needs of each local area
- The existing equipment deployed
- Likely future requirements

In addition, other factors such as the state of installation of the interconnect network, and the availability of appropriate funding will be considered.

The data system and UHF paging system will be implemented last. A prioritized implementation plan for these systems will be developed.

This plan will take into account many factors. These factors include the ultimate decisions regarding the required coverage area for data communications, the final decisions on the use of either P-25 VHF or dedicated UHF data operation and the particular dedicated data technology to be implemented. It is anticipated that the interconnection network will be complete; however there is the possibility of the need for additional network links to support the data system deployment.

The paging system deployment is gated by the coordination of the UHF radio frequency it will operate on. As discussed in the Baseline System Design document, the coordination of this frequency is expected to take a significant amount of time due to the radio frequency licensing issues near the Canadian border.

5 System Implementation Timeline

The NTIP Implementation Schedule shown in the chart in Section 5.3 (Chart 5-1), displays the principal tasks and associated timelines required for the procurement, construction and testing of the NTIP system. These system implementation recommendations, including the implementation schedule are based on information contained within the NTIP Baseline System Design document. Although this System Implementation timeline is preliminary, the

information used has been derived from similar system implementations. This helps assure that the proposed NTIP Implementation Schedule is accurate and applicable.

FE has allotted sufficient time for all tasks in the system implementation schedule to be performed. The schedule does not include unforeseen events such as significant delays due to severe weather conditions, equipment delivery delays or delays in the availability of funding.

5.1 Schedule Methodology

The system implementation schedule was developed from historical data based on radio systems similar to NTIP. Many of these systems were implemented using a phased approach, similar to that proposed for the NTIP system. The timeline presented draws from the commonalties among these systems. The implementation tasks were compared to other well developed performance plans to derive the data shown in the NTIP Implementation Schedule chart. Candidates for review include, the most recent Lewis and Clark system, the State of Florida, the State of Nebraska and the State of Wyoming system implementation plans.

5.2 Schedule Assumptions

The development of an accurate implementation schedule depends heavily on the system design and other information. This implementation schedule developed by ***FE*** is based on the best information available. At this time the design, the prioritization of sub-systems and other critical data is still in preliminary form. For this reason, the implementation schedule presented is also preliminary. These time estimates and the associated recommended implementation schedule are based on the following assumptions.

- The appropriate funding will be available throughout the system implementation schedule.
- The Northern Tier system will be organized and constructed as described in the NTIP Baseline System Design Document.

- The Northern Tier sub-systems will be organized and prioritized as described in this document.
- No more than ten new site buildings are required to be constructed using prefabricated construction methods.
- No significant weather issues will delay the system implementation.
- No significant equipment delivery delays will occur during system implementation.
- Acceptance testing of the radio system coverage is based on 95% reliability.
- Radio Coverage Acceptance testing is based on a sample of sites and/or areas.
- The Implementation schedule does not include the installation of subscriber equipment.

If during the equipment vender's final system design these assumptions change, or there is the occurrence of events beyond these assumptions, significant schedule changes may also be required.

5.3 Recommended Schedule

The attached chart (Chart 5-1) displays the preliminary implementation schedule developed by ***FE***. This schedule starts from the issuance of the Request for Proposals (RFP) on November 15, 2004 and concludes with the final acceptance of the system in November 2005.

The schedule shown makes use of a significant amount of overlap in the implementation of various portions of the NTIP system. The overlapping of schedule events increases the efficiency of the implementation. It does, however increase the management and coordination required.

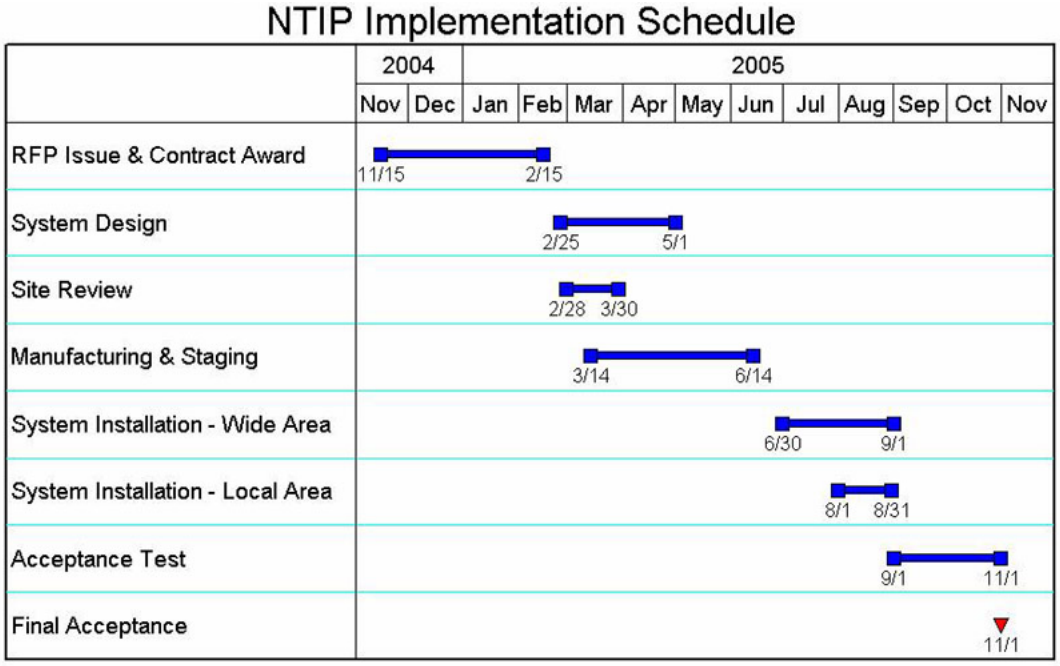

Chart 5-1

FE has allocated a period of approximately three months from the RFP release for the vendors' responses, vendor selection and contract administration. This period of time could be shortened if a procurement method other than an RFP is used. The range of these options must be evaluated by the purchasing department that will be coordinating this procurement. Each particular procurement process will have some schedule impact. Typically an RFP is considered the longest form of procurement, and therefore is used for planning purposes.

System design, site review, equipment manufacturing and staging occupy approximately four months of the system implementation time. The schedule assumes the use of a functional/performance specification rather than a detailed design specification. This is intended to reduce the overall risk to the NTIP Consortium and the State by making the selected vendor fully responsible for the design and system performance.

The installation of the wide area system spans a considerable distance and requires the implementation of the interconnection system. For this reason supplementary time has been added to the system installation period to allow for the additional travel required during radio and microwave site installations.

The installation of the local area systems is compressed, as it is assumed that many of these relatively independent sub-systems could be implemented simultaneously through the use of several installation teams.

The following sections detail the milestones contained within the NTIP Implementation Schedule.

5.3.1 RFP Issue and Contract Award

During this schedule task item the Request for Proposals (RFP) or other procurement documents will be issued to qualified system suppliers. Letters of intent-to-bid will be provided by interested vendors within the first two weeks. Within four weeks of the issuance of the RFP's a pre-bid conference will be held to answer initial questions pertaining to the RFP.

Proposals will be due for evaluation two months after the RFP's have been issued. Over the next month, finalists may be requested to make presentations on their proposals and optionally have the opportunity to make site visits. All proposals will be evaluated and a successful vendor will be notified.

5.3.2 Vendor Detailed System Design

The Vendor Detailed System Design schedule task item is the initial activity once a contract is established between the NTIP Consortium and/or the State and the selected vendor. The work in this task item is the development of the NTIP Final System Design document that will detail the specifications of the system infrastructure. The Final System Design document will include a system description, system drawings, finalized equipment list and other documentation as required to firmly define the system to be implemented.

During this period of time the vendor will also provide an updated Task List and description reflecting all activities to be completed as part of the system implementation and deployment. This documents will then be submitted to the to the NTIP project team for review and approval. Once approved, these will become the Statement of Work (SOW) for the system implementation.

5.3.3 Site Review

During the Site Review schedule task item, the radio and microwave sites that will be utilized in the system development will be inspected to ensure they meet the physical and electrical requirements for the proposed site equipment. The results of the site review will be documented and incorporated into a site audit report.

Additional site selection activities may be required if one or more selected sites are found to be unsuitable, or unavailable for use. This could have schedule impact. There is also the possibility for cost impacts if the conditions of the sites are found to be significantly different than expected. This issue should be addressed with the selected vendor early during the design stage to minimize schedule and cost risks to the system implementation.

5.3.4 Manufacturing and Staging

During the Manufacturing and Staging task item the system equipment will be manufactured, tested and configured at the vendor's facility. The NTIP project team will review the system's operational specifications with the vendor to establish the final features and configuration for the equipment.

The total system will then be staged at a facility capable of supporting the integration of all the various sub-systems. This allows for further configuration, integration and testing of the integrated system in an environment more suitable to testing and adjustment than would be available if implemented in the field. The staged system equipment will then be demonstrated and tested to the system operational requirements. This test will be witnessed and approved by the NTIP Program Manager.

5.3.5 Wide Area System Installation

The wide area system installation includes the physical placement, testing and optimization of the fixed network equipment for the wide area trunked system. This includes the radio equipment, microwave equipment, antenna systems and network control equipment. During this time, all radio sites will be installed and preliminary system functional and coverage tests will be conducted.

As discussed in Section 4 (Prioritized System Implementation) ***FE*** has endeavored to provide a plan that will best accommodate the system user requirements while maintaining the project schedule.

5.3.6 Local Area System Installation

The local area system installation includes the physical placement, testing and optimization of the fixed equipment for the local area systems. This includes the trunked radio equipment, the conventional radio equipment, additional microwave equipment as required, antenna systems, and console equipment. During this time the radio sites providing local coverage will be installed, and preliminary system functional and coverage tests of these systems will be conducted.

5.3.7 Acceptance Test and Final Acceptance

The Acceptance Test and Final Acceptance stage is an important phase of the system implementation. During this task the vendor will verify that the system specifications meet those agreed to in the System Design Document. Acceptance testing will include verification of the system functionality, performance, capacity and coverage.

Final acceptance will occur only after the vendor has successfully demonstrated, to the satisfaction of the NTIP Consortium, the full operation and functionality of the system. This will assure the NTIP Consortium and the State that the final system, as delivered and deployed, will meet the needs of the NTIP member agencies.

5.4 Implementation Summary

This preliminary implementation plan is based on the best information available at this time. As the design and priorities are refined it will have to be reviewed and updated. This will occur with each subsequent stage in the project development. The implementation schedule will be finalized as part of the SOW delivered by the selected vendor with their final design.

6 System Cost Estimates Overview

FE has developed preliminary cost estimates for the NTIP system. These cost estimates are based on the Draft Baseline System Design document. These estimates will be refined as the design is finalized through further research on cost factors and discussions with the vendor community.

These estimates are intended to be used to assist in the determination of budget and to assist in project and sub-project prioritization. Due to the significant amount of assumptions included in a cost estimate of this type, ***FE*** recommends that care be used to understand the implications of the assumptions when relying solely on these figures.

6.1 Cost Estimate Assumptions

The development of a cost estimate using this approach relies on many assumptions. These assumptions must be well understood to insure that the cost estimate produced is used properly. As the system design and the implementation plan are refined, many of these assumptions will need to be adjusted to become more in-line with the actual system and situation.

The cost estimates as shown in the Equipment Cost Estimate chart (Chart 6-1) are based on the following assumptions.

- The NTIP system is constructed as described in the NTIP Draft Baseline System Design document.
- These system costs do not include subscriber equipment.
- These system costs do not include expansion of the UHF data system.
- The radio coverage design criteria is based 95% reliability.
- The system is able to be implemented on VHF channels that require no unusual equipment for coordination or licensing.
- No more than ten new equipment shelters and towers are required to be constructed. (Note #1)

- No more than 20 microwave paths are required to be constructed. (Note #2)
- Redundant trunking central equipment is not required. (Note #3)
- The average number of frequencies at each trunking site is four.
- The average number of conventional channels in a local area system is four
- Total Services are calculated at 40% of equipment for radio and microwave systems.
- Program Management services are calculated at 8% of construction costs for equipment shelters and towers.
- Total costs include a contingency allowance of 10% to account for price increases and typical, but unforeseen costs.
- No contingency is included for inclement weather or unusually difficult construction environments

Notes:

#1 Construction costs can very widely. It as assumed that prefabricated shelters are used and tower construction requires no unusual construction methods.

#2 Microwave paths are assumed to consist of no more than ten OC-3 paths, and ten DS-3 paths. The number of total microwave paths could be higher if it is found that the existing carrier based wideband services (optical fiber links) are not able to provide the required service.

#3 Redundant trunking central equipment has not been included due to the possibility of sharing resources with other trunking systems, and the coverage redundancy provided by the local (non-trunked) systems.

6.2 Costing Method

The system cost estimates are based on pricing that has been proposed for other similar scale systems including regional and state-wide systems. ***FE*** has applied the cost information from public sources such as bid responses and government procurement contracts to arrive at typical, non- vendor specific list prices. These prices have been applied to a proto-typical equipment build-up of the Baseline System Design.

FE has estimated the cost of the typical services required to implement a system of this type and scale. Services for the staging, installation, testing and program management of the communications systems have been found historically to range from 25% to 50% of equipment costs. These services are estimated at 40% of the equipment cost for radio and microwave systems. Physical constructions tasks, such as towers and buildings, are estimated to require only program management services at 8% of estimated site infrastructure cost.

6.3 System Cost Estimate

The estimated total cost for the system as described is $13,400,000. This cost is based on retail pricing and does not include the savings usually associated with the competitive procurement process or through bulk purchases using existing shared contracts (e.g., Western States Contracting Alliance - WSCA).

In addition, the equipment cost savings achieved through sharing of sites, and through the reuse of existing equipment has also not been included. Until a vendor is selected and their final design is completed, there is a substantial risk of under-estimating the system costs if these potential savings are included in the estimation.

The following Equipment Cost Estimate Chart (Chart 6-1) is based on the equipment and services required to implement the Northern Tier Interoperability Project (NTIP) system. These system cost estimates include all equipment and implementation services including; program management, factory system integration and staging, installation services and acceptance testing. Subscriber units and dispatch center improvements have not been included in these estimates.

NTIP Infrastructure Equipment Cost Estimate					
Equipment:	Per Site	Wide Area System		Local Area System	
		Sites	Total	Sites	Total
Wide Area Trunked Sites	$87,000	12	$1,044,000		
Trunking Master Site	$1,750,000	1	$1,750,000		
New Local Area Trunked Sites	$87,000			4	$348,000
Expanded Local Area Trunked Sites	$61,500			3	$184,500
Local Area Conventional Sites	$80,000			10	$800,000
Microwave System	$2,850,000		$2,850,000		
Equipment Sub-total			$5,644,000		$1,332,500
Site Infrastructure: Shelter, Tower, and Generator	$245,000	10	$2,450,000		
System Sub-Total Less Services			$8,094,000		$1,332,500
Services:					
Site Development Project Management	$19,600	10	$196,000		
Radio and Microwave Services: Staging, Installation., Optimization, Acceptance Test, Project Management		40%	$2,257,600	40%	$533,000
Contingency		10%	$809,400	10%	$133,250
Total Sub-System Cost			$11,357,000		$1,998,750
Total System Cost					**$13,355,750**

Chart 6-1

7 Risk Analysis

The baseline design and the associated implementation plans are based on the information provided to ***FE*** including the previous studies and existing system information provided by the NTIP member agencies. The needs analysis generated from this information was presented and agreed to by the NTIP member agencies. However, as with any project this large and complex, there still are several areas where risks exist.

These risks fall into two main categories. The majority of the risks are categorized as either financial risks or schedule risks. Financial risks relate to the availability of funding and the costs associated with the system deployment. Schedule risks involve any of the many aspects of the system and environment that could delay the deployment.

There are financial risks that the funding streams available may fall short of the funding required to complete the system. There is additional financial risk that the estimated number of radio sites will fall short of the required number. There were also assumptions made as to the number of radio sites which would require significant upgrades. If the number of sites requiring upgrades or the magnitude of these upgrades is in error there could be additional financial risk.

In addition there is a risk associated with the members' expectations for the system. Although the system, as designed, is based on the needs collected, it is doubtful that within the available funding, each agency's requirements will be met fully. The design of a system to meet all these needs is typically well beyond the possibilities considering the available funding. These expectations, if not managed, can cause the expending of additional funds to satisfy one or more agencies perceived requirements at the expense of other system users' actual needs.

Due to the time frame involved, the fact that several of the agencies are currently upgrading their communications systems, there is the potential for uncovering some latent needs during the selected vendor's final detailed design process. This can become a financial or a schedule risk. ***FE*** will carefully monitor the progress of the final design to mitigate this risk, and will bring to the attention of the NTIP consortium any issue which can not be appropriately addressed.

The implementation cost and schedule estimates presented earlier in this document is based on a set of assumptions. The violation of these assumptions or the occurrence of events beyond these assumptions could add schedule and/or financial risk. The critical assumptions are repeated here for clarity.

- The NTIP system is constructed as described in the NTIP Draft Baseline System Design document.
- The system is able to be implemented on VHF channels that require no unusual equipment for coordination or licensing
- The appropriate funding will be available throughout the system implementation schedule.
- Ten new site buildings are required to be constructed using prefabricated construction methods.
- No significant inclement weather issues will delay the system implementation.
- No unusually difficult construction environments will delay the system implementation.
- No significant equipment delivery delays will occur during system implementation.
- Radio coverage design and acceptance testing of the radio system coverage is based on 95% reliability.
- Radio Coverage Acceptance testing is based on a sample of sites and/or areas.

As the design, cost, and schedule are refined, the risk factors that remain will require specific attention. Each risk factor will need to be addressed with a contingency or mitigation plan. At this time we do not anticipate any significant risks other than those associated with the availability of funds not yet committed to this project. The cost estimate includes a 10% contingency factor to address the cost risks associated with preliminary cost estimate of this type. The estimated schedule does not contain contingency time.